

REMARKS

Reconsideration and withdrawal of the objections and rejections of record are respectfully requested in view of the following remarks.

Summary of Office Action

As an initial matter, Applicants note with appreciation that a signed and initialed copy of the Form PTO-1449 submitted in the Information Disclosure Statement filed August 17, 2004 has been returned together with the present Office Action. In this regard, Applicants note that a Supplemental Information Disclosure Statement was filed on December 22, 2005, and consideration thereof is respectfully requested.

The specification is objected to because the abstract allegedly uses improper legal phraseology.

Claims 1-38, 41, 43, 46 and 47 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for allegedly failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

Claims 1-69 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Amendola, U.S. Patent No. 6,497,973 (hereafter "AMENDOLA").

Response to Office Action

Reconsideration and withdrawal of the objections and rejections of record are respectfully requested in view of the following remarks.

Response to Objection to Specification

The specification is objected to because the abstract allegedly contains improper legal phraseology such as “comprises” and “comprising”. Further, the statement at the end of the abstract pointing out that the abstract is not intended to define the invention disclosed in the specification nor intended to limit the claims should not appear in the abstract in the Examiner’s opinion.

Applicants respectfully traverse this objection. In this regard, it is pointed out that terms such as “comprises” and “comprising” are not “legal phraseology”, but are terms which are in common usage in everyday life. They merely indicate that an item includes or contains a specified component. Also, the present abstract is an almost literal recitation of claim 1 and thus reflects truthfully what the present application is about.

Applicants further note that they are not aware of any provision which prohibits the inclusion in the abstract of a statement that points out the non-limiting nature of the abstract. All that an abstract is required to be is a concise statement (not exceeding 150 words) of the technical disclosure of the patent application, as is the case with the present abstract (the present Office Action does not contain any statements to the contrary in this regard).

For at least the foregoing reasons, the objections to the present abstract are unwarranted and should be withdrawn, which action is respectfully requested.

Response to Rejection of Claims under 35 U.S.C. § 112, Second Paragraph

Claims 1-38, 41, 43, 46 and 47 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for allegedly failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. In this regard, the Office Action essentially asserts that the percentages recited in present claims 1, 25-28, 30 and 41 are indefinite because it is allegedly not clear to one of ordinary skill in the art if these percentages are by weight or by volume.

Applicants respectfully traverse this rejection. Specifically, the percentages recited in claims 1, 25-28, 30 and 41 indicate how much of a hydride compound has decomposed after a certain time period. Regardless of which basis is used for this percentage, the numerical value thereof will always be the same. For example, if x mole-% of a compound have decomposed, this necessarily means that x weight percent or x volume percent of the compound have decomposed. At any rate, in paragraph [0056] of the present application, the corresponding percentage is referred to as mole-%.

For at least the reasons set forth above, the rejection of claims 1-38, 41, 43, 46 and 47 under 35 U.S.C. § 112, second paragraph, is without merit, wherefore withdrawal thereof is warranted, and respectfully requested.

Response to Rejection of Claims under 35 U.S.C. § 103(a)

Claims 1-69, i.e., all claims of record, are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over AMENDOLA. The rejection alleges that AMENDOLA

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discloses an electrochemical storage medium in an electrochemical cell having a carrier mixed with a reduced boron-containing compound such as borohydride, wherein the carrier is an aqueous or non-aqueous solution including alcohols, glycols, etc., the carrier being present in an amount such that the borohydride is a pumpable slush at about 80-90 % by weight. According to the rejection, AMENDOLA also discloses that borohydride ions are stabilized by hydroxide ions. The Office Action further alleges that "eight moles of hydroxide ions per liter are disclosed in the discussion of Fig. 5 in Cols. 13-14." Also, the rejection alleges that the battery (electrochemical cell) of AMENDOLA "may include two units or chambers wherein the OH⁻ solution is in a separate chamber", and that no plasticizers, detergents, antifreeze and stabilizers are disclosed by AMENDOLA as being part of the contents of the electrochemical cell.

This rejection is respectfully traversed as well. Initially, Applicants note that it is not clear to Applicants which of the comments regarding AMENDOLA in the present Office Action relate to which claim. Clarification is respectfully requested. At any rate, AMENDOLA neither teaches nor suggests the subject matter of any of the present claims, as will be set forth below.

For example, present claim 1 is generally drawn to a concentrate that comprises a metal hydride compound (e.g., sodium borohydride and/or potassium borohydride), a solvent comprising one or more polar solvent components and a hydroxide-ion providing compound (e.g., NaOH and/or KOH), wherein the concentrate is storage stable, i.e., not more than about 2 % of the metal hydride decompose after storage for 4 weeks at about 25° C.

By way of background and as explained in, e.g., paragraph [0006] of the present specification, during storage of a borohydride fuel, a spontaneous decomposition reaction usually takes place. The present specification also sets forth that increasing the alkalinity of a borohydride fuel and, in general, of hydride containing liquids for use with fuel cells is an inexpensive and effective way of increasing the stability thereof. However, increasing the alkalinity of the fuel to a level which affords a desirable fuel stability for storage and transportation purposes will usually entail an impractical increase in the fuel viscosity (i.e., such that pumping of the fuel becomes difficult or even impossible), a decrease in the solubility of reaction products in the fuel and/or a drop in the specific energy capacity of the fuel. In particular, for practical purposes the optimum hydroxide concentration in a fuel will usually be in the range of from about 3 to about 6 mole/liter. Compliance with storage and transportation regulations, on the other hand requires a fuel stability which will often be achievable only at hydroxide ion concentrations of about 8 mole/liter and higher (see paragraph [0009] of the present specification). The present invention overcomes these problems by providing, for example, a concentrate with a storage-stability imparting concentration of hydroxide ions, which concentrate may be readily diluted to afford a fuel of, for example, suitable and convenient viscosity for use in a direct liquid fuel cell. While this dilution of the concentrate will decrease the storage-stability, this is not an issue once the fuel is inside the fuel cell and about to be used or being used therein.

AMENDOLA does not teach or suggest any of the elements of the present invention. In particular, AMENDOLA merely teaches a boron redox species containing

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liquid medium which provides an electrochemical cell (battery) with a favorable balance of characteristics, such as available energy, energy density, capital and operating cost, recharge efficiency, safety, environmental impact, serviceability and longevity (col. 1, lines 35-39). AMENDOLA does not address the storage stability of the liquid medium, let alone teach or suggest ways of increasing the storage stability thereof. Needless to mention that, AMENDOLA does not disclose the presence of a storage-stability imparting concentration of a hydroxide-ion providing compound in the boron redox species containing liquid medium, either. In this regard, it is noted that the present Office Action alleges that "eight moles of hydroxide ions per liter are disclosed in the discussion of Fig. 5 in Cols. 13-14." Applicants could not find a corresponding disclosure in cols. 13-14 of AMENDOLA.

At any rate, the present invention is not predominantly concerned with, e.g., a liquid (boro)hydride fuel inside a liquid fuel cell (which the Examiner appears to consider to be equivalent to the boron redox species containing medium inside the electrochemical cell of AMENDOLA), but with a fuel concentrate which as such (i.e., before dilution thereof) may not even be usable as, e.g., liquid fuel in a liquid fuel cell, or at least would not have the desired properties for use in such a fuel cell.

The Office Action further notes that AMENDOLA discloses a pumpable borohydride slush at about 80 to 90 % by weight. Applicants respectfully submit that while this slush may be considered to be a concentrate, it is not a concentrate according to the present invention, because the concentration indicated by AMENDOLA refers to the borohydride, i.e., not to a hydroxide ion providing compound. In fact, AMENDOLA is

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silent with respect to the presence of a hydroxide ion providing compound in this slush.

From the context of the Examiner's reference to the slush of AMENDOLA it appears that the corresponding comments may relate to present claim 28, which recites solvent in an amount of at least 15 % by volume of the concentrate. In this regard, it is noted that claim 28 is drawn to

A process for preparing a metal hydride containing liquid for use in a fuel cell from a storage-stable concentrate, wherein the process comprises combining (a) a concentrate which comprises at least one metal hydride compound and a polar solvent and has a hydroxide ion concentration of at least about 7 moles per liter, and not more than about 2% of the at least one metal hydride compound decomposes when the concentrate is stored for 4 weeks at about 25.degree. C., and (b) a solvent in an amount of at least about 15% by volume of the concentrate.

Accordingly, claim 28 essentially indicates that in the claimed process of making a metal hydride containing liquid for use in a fuel cell from a storage-stable concentrate which has a hydroxide ion concentration of at least about 7 moles per liter, the concentrate is diluted with at least about 15% by volume, based on the concentrate, of a solvent. AMENDOLA does not teach or suggest, for example, that the borohydride slush disclosed therein has a hydroxide ion concentration of at least about 7 moles per liter, or that the slush is to be diluted with at least about 15 % by volume, based on the slush, with a solvent.

The present Office Action also alleges that the battery (electrochemical cell) of AMENDOLA "may include two units or chambers wherein the OH- solution is in a separate chamber". Again, Applicants can only speculate that this comment may relate to present claim 49. Claim 49 is drawn to

A container filled with a metal hydride containing liquid, wherein the container comprises a first compartment and at least one second compartment, the first compartment containing a concentrate which comprises at least one metal hydride compound and a polar solvent and has a hydroxide ion concentration of at least about 8 moles per liter, and the at least one second compartment containing a solvent in an amount sufficient to result in a hydroxide ion concentration of not higher than about 7 moles per liter for the combination of the solvent in the at least one second compartment and the concentrate in the first compartment.

Should the Examiner be of the opinion that the battery of AMENDOLA and the chambers thereof qualify as the container of instant claim 49 and the compartments of the container, respectively, Applicants respectfully submit that even if this were the case (which it clearly is not), the "OH-solution" in the container of the present invention is not in a separate compartment (i.e., separate from the metal hydride compound). Claim 49 clearly recites that the concentrate comprises at least one metal hydride compound and a polar solvent and has a hydroxide ion concentration of at least about 8 moles per liter. The second compartment contains solvent in an amount which will reduce the hydroxide ion concentration of the concentrate to not higher than about 7 moles per liter. Further, AMENDOLA does not appear to disclose any hydroxide ion concentrations which are the same or similar to those recited in claim 49. Accordingly, AMENDOLA does not render obvious the subject matter of claim 49 and the claims dependent therefrom, either.

Applicants submit that for at least all of the foregoing reasons, the rejection of claims 1-69 under 35 U.S.C. § 103(a) over AMENDOLA is unfounded, wherefore withdrawal thereof is warranted and respectfully requested.

CONCLUSION

In view of the foregoing, it is believed that all of the claims in this application are in condition for allowance, which action is respectfully requested. If any issues yet remain which can be resolved by a telephone conference, the Examiner is respectfully invited to contact the undersigned at the telephone number below.

Respectfully submitted,
Gennadi FINKELSHTEIN et al.

A handwritten signature in dark ink, appearing to read 'Neil F. Greenblum', is written over a horizontal line.

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